





# OPHTHALMIC CONTRIBUTIONS.

## I.

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(Reprinted from the American Journal of the Medical Sciences, January, 1873.)

## II.

### AN ADDITIONAL METHOD FOR THE DETERMINATION OF ASTIGMATISM.

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(Reprinted from the Philadelphia Medical Times, February 15, 1873.)

BY

GEORGE STRAWBRIDGE, M.D.,

LECTURER ON DISEASES OF THE EYE AND EAR IN THE UNIVERSITY OF PENNSYLVANIA;

OPHTHALMIC SURGEON TO THE PRESBYTERIAN HOSPITAL IN PHILADELPHIA;

ATTENDING SURGEON TO THE EYE AND EAR INFIRMARY OF THE

PHILADELPHIA DISPENSARY, ETC.

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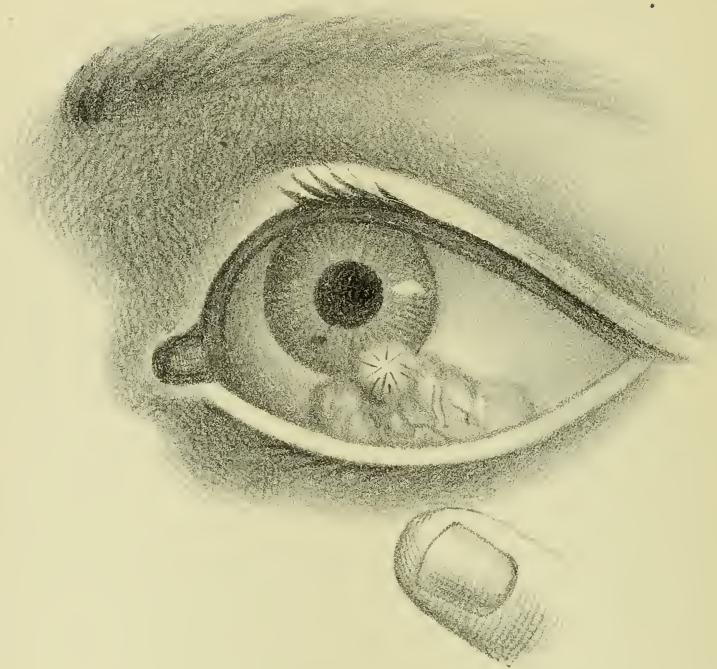
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DERMOID TUMOUR OF CORNEA.

DOUBLE LIFE SIZE.



## I.

### A CASE OF DERMOID TUMOR OF THE CORNEA.

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(PLATES I., II.)

A DESCRIPTION of this case is offered with the hope that it may prove to be of interest from the fact of its belonging to a class of very rare affections of the eye.

Miss M. presented herself on account of a tumor of the left cornea, which was congenital and characterized as follows: arising on the outer lower quarter of the cornea, at a distance of three millimetres from the corneal edge, and having a diameter at its apex, which was rounded, of three millimetres, it extended on the eyeball between the inferior and external recti muscles, spreading out sufficiently to fill up the space between these two muscles, and passing beyond the juncture of the anterior and posterior segment of the eyeball.

The color of the tumor at its apex was of a pearly-white; and in the median line, towards its base, the same color prevailed, although gradually changing into a yellow hue as the periphery of the growth was approached, where it finally became markedly yellow.

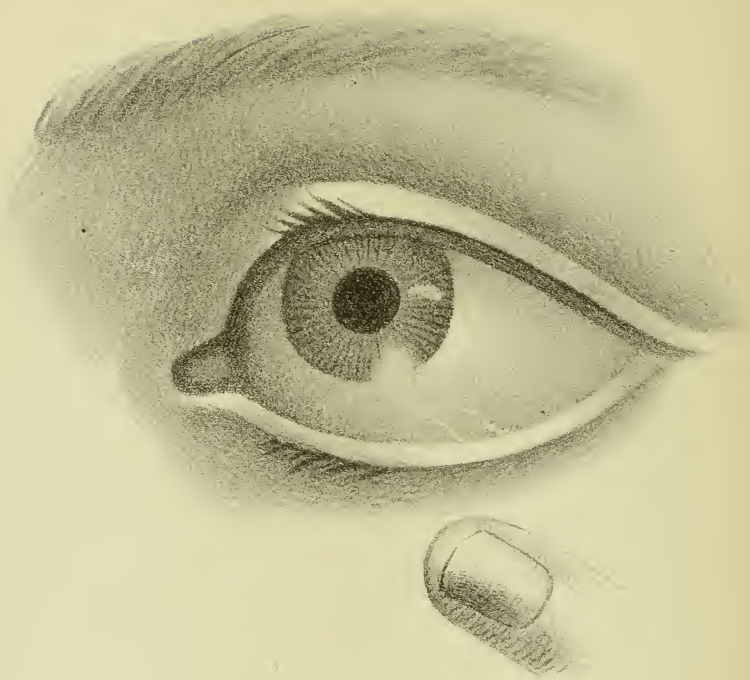
On the corneal portion of the growth a *number of minute hairs* were seen, four or five of which were of a dark color and larger in size, while the remainder were entirely devoid of pigment. Several large veins traversed the growth at its base, and the mucous membrane covering it was thickened. (See Plate I.)

The increase in the size of the tumor had been very slow, bearing a relative proportion to the increase of the body, and its removal was desired principally for cosmetic reasons, and also with the hope that the eye, which presented some asthenopic symptoms, might be benefited.

The movements of the eyeball were entirely normal, and the acuity of vision in no way affected.

The removal of the growth was accomplished by a careful dissection of it from the surface of the cornea, made by a small Graefe cataract knife, the apex of the tumor being firmly grasped by a pair of forceps; great care was taken not to





EYE. AFTER REMOVAL OF DERMOID.

(SEE PLATE I.)

DOUBLE LIFE SIZE.

penetrate too deeply into the corneal tissue. This dissection was continued backward toward its base, until the tumor was well separated, and a pair of scissors divided the few remaining connecting bands.

Extreme toughness of the corneal portion was noticed, the knife cutting through it as through fibrous tissue, and at the same time it was found closely adherent, while, on the contrary, the sclerotic portion presented no difficulty in its separation. No great amount of bleeding followed its removal, and the after-treatment consisted in the application of a pressure bandage for four days, and then a green shade, and at the end of a week the patient was allowed out-door exercise. At the present time no trace of the growth remains, save a slight corneal opacity at its former seat. (See Plate II.)

Examination of the corneal portion of the growth showed all the characteristics of true skin, which became gradually lost in the sclerotic portion, which was made up to a great extent of adipose tissue.

Similar growths have been reported by a number of observers. Ryba,<sup>1</sup> in the year 1853, made

<sup>1</sup> Ryba, Prager, Viertel Jahrschrift, 1853, Bd. iii. 1.

a summary of the cases of dermoid tumor of the cornea reported up to that time, twenty-seven in number occurring on the human eye, three on oxen's eyes, and four on the eyes of dogs.

Tumors of this kind are also reported by Graefe,<sup>1</sup> Virchow,<sup>2</sup> Arlt,<sup>3</sup> Mackenzie, White, Cooper,<sup>4</sup> W. T. Taliaferro,<sup>5</sup> Hulke,<sup>6</sup> and H. R. Swanzy.<sup>7</sup>

Dermoid growths were formerly known under the name of "warts," and confounded with many other forms of tumors. They occur most frequently on the lower outer portion of the cornea, less so on the upper corneal border, more rarely on the inner corneal border. Cases are also reported occurring in the scleral conjunctiva at the inner palpebral angle: as a rule, they will be found in the broad zone lying rather beneath the horizontal meridian of the eyeball than above it, in the direction of the zone of the lid commissure.

They vary in size from that of a grain of pep-

<sup>1</sup> Archiv für Ophthalmologie, vii. 2, page 3, x. 1, page 214.

<sup>2</sup> Archiv für Pathologische Anatomie. Sechster Band. Heft. 4, 555.

<sup>3</sup> Arlt's Krankheiten der Binde und Hornhaut, page 170.

<sup>4</sup> London Med. Gaz., Nov. 1841, page 278.

<sup>5</sup> Am. Journ. Med. Sci., July, 1841, page 88.

<sup>6</sup> Ophth. Hosp. Rep., vol. iii. p. 332.

<sup>7</sup> Dublin Quarterly Journal of Medical Science, May, 1871.

per to a bean—round or oval in form, having a soft sponge-like consistence, or, on the contrary, they may be tough, and of a hardness like cartilage.

Their color varies also greatly; the greater number are found to be of a white or yellowish-white hue, less frequently they are found red, reddish-brown, or very dark brown. Their surface is often smooth, or it may be like a raspberry or strawberry, lobulated, and with, or rarely without, a number of delicate, short, transparent, or sometimes colored, hairs projecting from them. These growths consist of connective and elastic tissue, covered by a layer of thick epithelium, in which the hair follicle is placed; sudoriferous and sebaceous glands are often found, together with fat cells. They are almost, without exception, congenital, and grow in proportion to the rest of the body. (Ryba, Fischer, E. Muller, Graefe, Ammon, Virchow.)

The origin of these peculiar growths, as they are always congenital, must be found to a great extent in the conditions attending the development of the foetus. Ryba, who has spent much time in their study, gives the following explanation:—

It is well known that the conjunctiva, in early



foetal life, corresponds in its texture entirely with the skin covering in general. That portion covering the eyeball becomes gradually thinner, and, at about the tenth week, elevates itself, at the upper and lower orbital borders, into folds, which develop into two skin folds to form the rudimentary eyelids, and toward the end of the third, or commencement of the fourth, month they have widened themselves sufficiently to come in contact with each other, and to entirely inclose the eyeball. For this reason it is clear why the median horizontal zone of the eye, in whose circuit these peculiar growths are always found, remains the longest uncovered by the eyelid. The general skin covering acquires its fully developed characteristics as foetal life draws to a close, except the inverted portion of skin which develops into mucous membrane to form the conjunctiva. Now, if we suppose a case where the two rudimentary lids do not finally widen sufficiently to form a covering over the eye, but leave an intermediate space where the eyeball is exposed, then at this point the membrane covering the eyeball will not develop into mucous membrane, but into a membrane resembling skin, and will fill up the gap between the eyelids by, as it were, a third lid; so that, by this explanation, the corneal der-



moid might be considered an attempt towards forming a rudimentary eyelid. And Ammon and others have reported cases of coloboma of the eyelid, where a dermoid growth was found filling up the gap.

*Treatment of these tumors.*—They should be removed as soon as practicable, as they become larger, and, especially if covered with hair, act as irritants to the eye, and for this and cosmetic reasons their removal is indicated. Care should be observed not to cut too deeply into the cornea in their removal, as from this cause corneal sup-puration has occurred.

A slight corneal opacity is always left after the operation.

## II.

### AN ADDITIONAL METHOD FOR THE DETERMINATION OF ASTIGMATISM.

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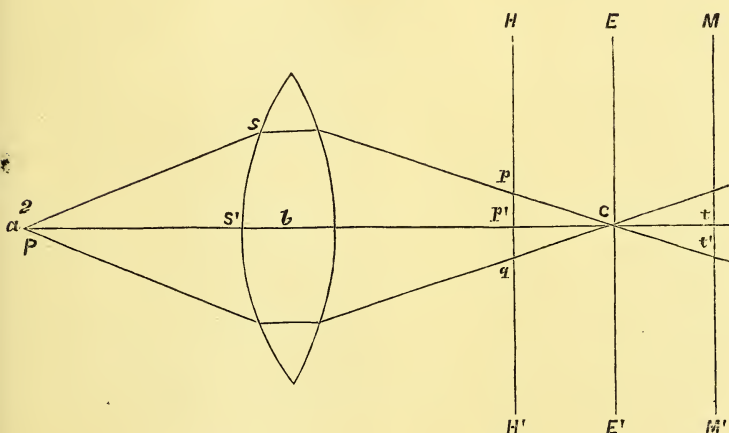
I THINK it will be readily admitted that a more simple and convenient method for the determination of astigmatism is something very much to be wished for, but as yet not reached; and, with this end in view, I submit the following plan based on an experiment described in "Helmholtz's Optics," page 107, to wit:—

"If the light from a gas-lamp, or from the sky, be allowed to pass through a small round opening in a screen, such a light will appear, to an eye not exactly accommodated for it, as a star, with light radiation proceeding from it in various directions; now, if a diaphragm is pushed slowly from the side so as to pass gradually in front of the eye, it will be observed that this 'light figure' begins to be *shaded* on the *same side from which the diaphragm was moved*, if the object is

*farther removed than the point for which the eye is accommodated, but from the opposite side, if the object is nearer than the point for which the eye is accommodated."*

The reason of this will be readily seen by examination of the following figure.

Fig. 1.



*a*, Light-point in space; *b*, Refractive media of eyeball; *C*, Focus of lens, *b*; *E E'*, Position of retina in emmetropic eye; *H H'*, Position of retina in hypermetropic eye; *M M'*, Position of retina in myopic eye.

Rays of light proceeding from point *a*, after passing through lens *b*, will unite at point *C*, and on the retina *E E'* a sharp image of the object will be thrown. But, suppose the eye to be hypermetropic, and the retina to be at *H H'*, then, instead of a sharp image, circles of disper-

sion will be formed of a diameter represented by  $p q$ . If in this circle we particularize the two points,  $p q$ , which are met by the light proceeding from  $a$ , as a result, the individual, under these circumstances, will consider that the upper point  $p$  in the retina represents the image of an object situated in the field of vision below the real light-point  $a$  (as  $P$  in diagram), and the lower point  $q$ , of an object *above* the real light-point (as  $Q$  in diagram); following the rule that images on the retina are inverted, and a lower-situated object corresponds to a higher-situated image on the retina.

Now, it will be readily understood that, by cutting off the rays of light as in the section  $SS'$  by a diaphragm, if the eye is *hypermetropic*, the semicircle of light-dispersion,  $pp'$ , on the retina  $HH'$ , will be intercepted; while, if the eye is *myopic*, the semicircle of light-dispersion,  $tt'$  on retina  $MM'$ , will be intercepted, and to the observer the effect will be, if hypermetropia exists, that the lower half of the light-circle at  $a$  will first vanish; while, if myopia exists, the upper half of the light-circle will first disappear as a consequence of the position of the images on the retina.

With these preliminary remarks, I proceed to describe the method of examination:—

In the centre of a Bristol-board, a round aperture of thirteen millimetres diameter is made, and at a distance from this aperture of six centimetres, radiate bars are cut in the Bristol-board, having a length of nine centimetres, and a width of five millimetres, and forming an angle with each other of ten degrees. (See Fig. 2.) Over this figure, white gauze paper is passed, and a lamp, placed behind, illuminates it in its entire extent.

The patient is placed at a distance of twenty feet from the figure, and requested to observe the round central opening, and to notice in what direction it is most elongated. This is readily determined by observing to which of the bars in the figure the light-prolongation most closely corresponds in its direction, and the result will be controlled, as to its accuracy, by also finding which of the bars are most distinctly seen. For example, in a case of myopic astigmatism in the vertical meridian, it would be found that the light-elongation would be upward and downward, and at the same time the vertical bar would be most distinctly seen.

By this procedure the *direction* of the meridian

is discovered. The next step is to determine the *refraction* of the *meridian*.

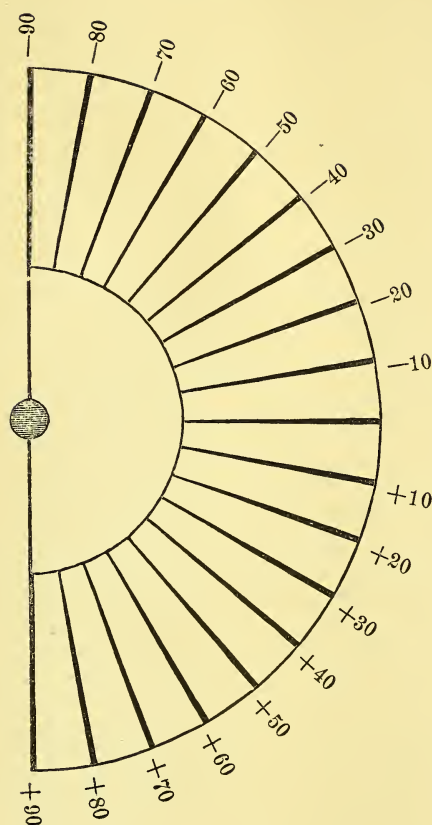
To this end a diaphragm is advanced in the direction of the greatest elongation of the round light (suppose it to be vertical, and that the diaphragm moves from above downward), and the patient is requested to notice whether the upper half of the round light first disappears or the lower half, as the diaphragm moves downward; if the upper half is first gone, the meridian is shown to be so curved as to cause a *myopia* to exist: while, if the lower half of the round light is the first to disappear, we conclude that a *hypermetropia* exists.

If the entire round light is found to disappear at once, it may be concluded that very little astigmatism exists.

The direction of the meridians being now known, as well as their refraction, whether normal or so curved as to cause a myopia or hypermetropia, the next step would be to determine exactly the *amount* of *abnormality*.

To this end we proceed with spherical glasses, determining the exact one necessary to see distinctly the proper bar, as in the method laid down by Snellen.

Fig. 2.



Advantages of this method—

1. Simplicity. The usual methods are, as a rule, so complicated that the patient often becomes confused in the examination, and an error can easily result; but to this new procedure no such objection can be made.



2. Accuracy, which results from the extreme delicacy of the test formed by the illuminated bar.

3. The great saving of time, arising from the fact that the mode of examination can be conducted so much more quickly than by the ordinary methods.

4. This method allows of examination being made entirely independent of daylight, and so obviating any inconvenience arising from defective illumination found in cloudy weather, etc.

In Figure 2, the black circle and broad lines represent the central round aperture and bars, which are illuminated by a light placed behind. To Dr. John Green, of St. Louis, I am indebted for the idea of arranging the bars, as radii of a circle.

NOTE.—Since the above article was printed, I have made constant use of this method of examining astigmatic cases, and have found it in every way most satisfactory.

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#### OPHTHALMOMETRICAL MEASUREMENTS OF THE CORNEA AND CRYSTALLINE LENS.

That the asymmetry of the cornea (which is the principal cause of regular astigmatism) is to a great extent corrected by a similar condition of



the crystalline lens, is shown in the following ophthalmometrical measurements.

The lens and corneal images were obtained by the use of sunlight, and the *radius of curvature* of the *lens* and *cornea* in *both vertical* and *horizontal meridian* calculated.

R = Radius in millimetres.

#### CASE I.—N. H., æt. 23.

- Cornea. Vertical meridian. R=7.8549 mm.  
 Horizontal meridian. R=8.5227 mm.
- Lens. Anterior Surface.  
 Vertical meridian. R=11.143 mm.  
 Horizontal meridian. R=10.761 mm.
- Lens. Posterior surface.  
 Vertical meridian. R=5.3591 mm.  
 Horizontal meridian. R=5.7015 mm.

#### CASE II.—S. H., æt. 24.

- Cornea. Vertical meridian. R=8.3509 mm.  
 Horizontal meridian. R=8.8811 mm.
- Lens. Anterior surface.  
 Vertical meridian. R=11.043 mm.  
 Horizontal meridian. R=9.8506 mm.
- Lens. Posterior surface.  
 Vertical meridian. R=5.3227 mm.  
 Horizontal meridian. R=5.302 mm.

It will be seen that the cornea in the *vertical* meridian had its *greatest* curvature, while the lens in this meridian had its *least* curvature. In

the *horizontal* meridian the cornea was the *least* curved, while the lens had its *greatest* curvature. So that the union of the two lens systems would to a great degree neutralize the asymmetry of the single one, and so lessen the amount of astigmatism.





LARGE CYST OF IRIS.



EYE. AFTER ITS REMOVAL.

DOUBLE LIFE SIZE.

### III.

#### CYST OF THE IRIS—REMOVED BY OPERATION.

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As the literature of cystic growths of iris is by no means large, this contribution may not be out of place.

The history of the case, as given by the patient, Mr. G., æt 70, is, that one year ago an unusual watery condition of the left eye was noticed, which gradually increased, and especially so when encountering a strong light, which caused such a degree of lachrymation that vision was thereby seriously interfered with. The eye was also painful. A few months later, the sight of the eye had decreased to such an extent that reading or writing was impossible, while the lachrymation was so great that, on attempting to write with the aid of his right eye, the paper was as if sprinkled with water. The pain had increased, and was of a smarting, burning character. The right eye had also become *sympatheti-*

*cally affected*, so that the light caused him great annoyance ; while the amount of use he derived from it was very limited.

At the time of my examination, one year from the commencement of his trouble, a perfectly *transparent cyst* was visible in the anterior chamber of the left eye (see Plate III., Fig. 1), in its outer lower quarter, having a height of five millimetres, and at its base a breadth of eight millimetres, and oval in shape. Oblique illumination showed it to be clear fluid contained within a transparent membranous bag.

The iris, which could be distinctly seen through this body, was pushed backward, causing it to be deeply concave at that point, and of a much darker color, by reason of its black uveal layer being brought into view. The cyst filled up the space between the iris and cornea completely ; and the cornea directly over it was slightly cloudy. The pupil remained round, with slightly abnormal dilatation, while the crystalline lens had become cataractous. Congestion of the conjunctival and ciliary bloodvessels existed to a moderate degree. Tension of the eyeball was slightly increased, and any amount of pressure caused pain.

The patient found the pain and annoyance to

the right eye to be so rapidly increasing that he readily submitted to the operation for its removal.

A puncture was made in the periphery of the cornea, just below its horizontal meridian, with a Graefe cataract knife, which was then passed downward in the anterior chamber (transfixing the cyst in its passage) and the counterpuncture made at a point three lines distant from the puncture, and the cut completed. The collapsed cyst was then seized with a small curved iris-forceps, and gentle traction used to effect its removal. It soon became evident that the cyst and iris were firmly bound together, and the greatest care was required to prevent separation of the entire iris. Its complete removal was finally accomplished, together with that of the underlying iris-tissue.

No complication followed, and the eye healed rapidly. Fig. 2 represents the eye eleven months after the operation. The pupil is drawn outward and downward toward the old corneal opacity, causing the change in its shape; the loss of iris by the operation is also seen. The condition of the cornea and lens shows no change. Tension of eyeball normal; the patient is entirely free from any pain or discomfort in either eye, and is able to use his right eye in reading and other fine



work at pleasure, and there is *no sign of return of the cyst*.

Examination of the cyst showed it to belong to that class having a delicate membranous wall with epithelial lining and clear fluid contents. It evidently originated in the iris.

Mr. Hulke,<sup>1</sup> in his admirable report on cysts in the iris, has collected the histories of twenty-one cases, reported by Tyrrell,<sup>2</sup> Wharton Jones,<sup>3</sup> Dixon,<sup>4</sup> Guepin,<sup>5</sup> Bosteils,<sup>6</sup> Graefe,<sup>7</sup> Wordsworth,<sup>8</sup> Mackenzie,<sup>9</sup> Turner,<sup>10</sup> Combessis,<sup>11</sup> White, Cooper,<sup>12</sup> Stoeber,<sup>13</sup> Richard,<sup>14</sup> Haynes, Walton,<sup>15</sup> and Hulke.<sup>16</sup> To these add one case published by Fisher,<sup>17</sup> one by Graefe,<sup>18</sup> one by Arlt,<sup>19</sup> six by

<sup>1</sup> Ophth. Hospital Reports, vol. vi. p. 12.

<sup>2</sup> Tyrrell on the Eye, vol. i. p. 368.      <sup>3</sup> Lancet, xvi., 1852, p. 120.

<sup>4</sup> Dixon, Ann. d'Oc., tome xxxvii. p. 141, 1857.

<sup>5</sup> Guepin, Ann. d'Oc., tome xlv., 1860.

<sup>6</sup> Bostells, Ann. d'Oc., tome lii., 1864, p. 175.

<sup>7</sup> Archiv für Ophthalmologie, Bd. xii. Abth. 2, S. 228.

<sup>8</sup> Unpublished.

<sup>9</sup> Mackenzie, edit. iv. p. 704.

<sup>10</sup> Monthly Journal of Medical Science, vol. i. p. 270, 1841.

<sup>11</sup> Gazette Hebdomadaire, 1855.

<sup>12</sup> Journal of Medicine, Sept. 1852, p. 789.

<sup>13</sup> Gazette Hebdomadaire, tome ii. p. 55.

<sup>14</sup> Ibid., tome i. 1082.

<sup>15</sup> Medical Times, August 5, 1854, p. 139.

<sup>16</sup> Ophth. Hosp. Reports, vol. vi., 1869, p. 12.

<sup>17</sup> Lehrbuch der gesammten Entzündung und organische Krankheiten des Auges, 1846, § 11.

<sup>18</sup> Archiv der Ophth., Bd. iii. Abth. ii. p. 412.

<sup>19</sup> Arlt, Lehrbuch, Abth. iv. p. 109.



Mooren,<sup>1</sup> one by Wecker,<sup>2</sup> one by Knapp,<sup>3</sup> and the one now published, making a *total of thirty-three cases published up to the present date.*

In these cases the cysts were found in size from that of a small pea to one four lines in height. They also exhibited great variety in color, some having a glistening white appearance like a pearl or the tendon of a muscle, others of a more blueish cast, the remainder being brown, reddish-brown, or opaque-brown.

The cyst-wall in some cases was found to consist of a transparent membrane with epithelial lining, while in others it was thick and tough, like cartilage; and the researches of Bowman and others have proved that in a great number of cases the cyst-wall is formed by the rarefied tissue of the iris, and that the uveal pigment forms the epithelial covering of the inner wall of the cyst.

The cyst-contents may consist of a clear, limpid fluid, or they may be thick, opaque and gelatinous, or they may be composed of epithelium, fatty matter, cholesterine, and hair, as in the case reported by Graefe.<sup>4</sup>

<sup>1</sup> Klin. Monats., b. p. 362, et Ann. d'Ocul., tome liv.

<sup>2</sup> Archives of Ophthalmology and Otology, vol. i. part i. p. 86.

<sup>3</sup> Ibid., vol. i. par. ii. p. 411.

<sup>4</sup> Archiv f. Ophth., Bd. iii. Abth. ii. p. 412.

The origin of the cyst may be either in the iris, or in the ciliary bodies, or in the portion of iris tissue involved in the sclero-corneal cicatrix.

In more than two-thirds of these cases the eye had sustained some previous injury, such as a penetrating corneal wound; and this suggested to Mr. Hulke the idea that in some instances the cyst may originate out of a portion of Desce-met's membrane, which may have been torn away from the back of the cornea by the penetrating body and carried before it into the iris.

Wecker considers these cystic growths to be the result of sacculation of the iris, and the inclosed fluid to be the aqueous humor. The iris becomes attached to the posterior wall of the cornea (often after penetrating wounds of the cornea) in such a way that an opening is still left in the adherent parts, through which the aqueous humor enters, and this finally develops into a cyst. This would very well account for that class of cysts occurring in eyes which have previously suffered from irido-choroiditis with synechial formations, or where the sacculation has been produced by a penetrating wound; but in another variety of cases where the cyst has developed without any previous cause, Mr. Bow-

man's theory<sup>1</sup> is much more plausible—namely, that they are due to a morbid collection of fluid between the iris and its uveal layer, and that the first formation of the fluid is attended with a swelling of the uvea backward toward the suspensory ligament and the lens; but, as the contact of these resisting parts must very speedily arrest any further advance in that direction, the accumulating fluid next begins to push forward the proper tissue of the iris. The highly extensible fibres of the iris slowly yield, until in the course of months they bulge before this fluid, and finally come in contact with the cornea, and sometimes may cause the pupil to be thrown toward the opposite side or to be rolled in front of it. This view is also confirmed by microscopic examination, which shows that the cyst-wall is often to a great extent made up of distinct iris-tissue with the uveal pigment layer forming the inner epithelial covering. This theory would explain the occurrence of the cyst in the case now published.

Graefe insists that, in some instances at least, the cyst must be regarded as a new formation,

<sup>1</sup> Lectures on the Parts concerned in Operations on the Eye, p. 75, London, 1849.

and supports his view by a case of dermoid cyst of the iris which contained epidermis and hair with amorphous fat and cholesterine.

As the histories of all cysts of the iris show that, *if allowed to remain, they invariably become the cause of inflammatory action in the eyeball, in the form of a choroiditis or irido-choroiditis, with often sympathetic inflammation of the other eye*, the indication is always to *remove them as soon as possible* before impairment of sight has occurred.

*Puncture* of the cyst has been repeatedly tried, but is so generally unsuccessful that *excision* is much to be preferred; although the latter operation is not without risk.



